1. (Currently Amended) A motor/generator for a flywheel energy storage system having a housing adapted to be evacuated and maintained at a low pressure atmosphere, a flywheel supported for low-loss rotation in said low pressure atmosphere within said housing on a bearing system, a nonevaporable getter for maintaining said low pressure atmosphere in said housing, and a motor/generator for accelerating and decelerating said flywheel for storing and retrieving energy, said motor/generator comprising:

a rotor that is coupled to and rotates with said flywheel;

a stationary stator that cooperates with said rotor for converting between electrical and mechanical energy in said flywheel system and contains electromagnetic coils;

wherein said stator has a thin barrier coating for minimizing ~~degredation~~ degradation of said low pressure atmosphere by minimizing outgassing from said stator into said housing.

2. (Original) A motor/generator for a flywheel energy storage system as described in claim 1, wherein:

said flywheel is constructed principally of steel.

3. (Original) A motor/generator for a flywheel energy storage system as described in claim 2, wherein:

said barrier coating is a metal.

4. (Original) A motor/generator for a flywheel energy storage system as described in claim 2 wherein:

said electromagnetic coils are substantially enclosed in said barrier coating.

5. (Original) A motor/generator for a flywheel energy storage system as described in claim 4, wherein:

said motor/generator stator has a laminated core; and

said barrier coating covers vacuum exposed surfaces of all laminations in said motor/generator core.

6. (Original) A motor/generator for a flywheel energy storage system as described in claim 2, wherein:

said motor/generator has a separate motor and a separate generator.

7. (Original) A motor/generator for a flywheel energy storage system as described in claim 2, wherein:

said metal barrier coating is constructed of metal foil.

8. (Original) A motor/generator for a flywheel energy storage system as described in claim 7, wherein:

said foil is bonded to said stator after manufacture.

9. (Original) A motor/generator for a flywheel energy storage system as described in claim 7, wherein:

said foil is bonded to said stator during manufacture by potting said stator with a bonding agent inside said foil.

10. (Original) A motor/generator for a flywheel energy storage system as described in claim 2, wherein:

said stator is enclosed in a nonmetallic container that holds a cooling liquid and said nonmetallic container is coated with a barrier coating;

11. (Original) A motor/generator for a flywheel energy storage system as described in claim 1, wherein:

said barrier coating is applied by physical vapor deposition.

12. (Original) A motor/generator for a flywheel energy storage system as described in claim 10, wherein:

said barrier coating is a metal.

13. (Original) A motor/generator for a flywheel energy storage system as described in claim 10, wherein:

said barrier coating is a ceramic.

14. (Original) A motor/generator for a flywheel energy storage system as described in claim 1, wherein:

said barrier coating is applied by a process selected from the group consisting of dipping, wiping, spraying and brushing.

15. (Original) A motor/generator for a flywheel energy storage system as described in claim 1, wherein:

said barrier coating is in the form of a colloidal suspension of particles prior to application.

16. (Original) A motor/generator for a flywheel energy storage system as described in claim 15, wherein:

said particles in said colloidal suspension of particles are carbon particles.

17 and 18 (Canceled)

19. (New) A flywheel system made of components assembled inside an evacuated chamber, said flywheel system having a barrier coating to reduce outgassing from said components of said flywheel system, comprising:

a deposit of a vaporized metal vapor as barrier coating of said metal inside said chamber on said flywheel system components.

20. (New) A flywheel system as described in claim 19 wherein:

said barrier coating has a thickness between 1000 Angstroms and 10 mils.

Remarks

Applicants respectfully request reconsideration of this application as amended herein.

Claims 1 and 19-20 have been rejected under 35 USC 103 as unpatentable over Bitterly in view of Sharmo. Bitterly describes a flywheel based energy storage system having a flywheel coupled to a rotor 130 of a motor/generator 20a. The motor/generator is said to have a stator 290, although there does not seem to be anything in the drawings labeled "290". Whatever the "stator 290" is, it is mounted for vertical movement (and therefore is not "stationary") on a translation carriage 292, which is labeled in Fig. 3.

Shramo teaches a large air gap motor with a coil form 37 that is aluminized to reflect heat from the stator coil 15 back toward the finned stator housing 27.

Claim 1 calls for a thin barrier coating on the stator for minimizing degradation of the low pressure atmosphere in the housing by minimizing outgassing from the stator into the housing. The rejection of claim 1 is based on the theory that it would have been obvious to a person of ordinary skill in the art to use a heat reflecting shield like Shramo's in the Bitterly device to reflect heat away from Bitterly's rotor 130. Applicants respectfully traverse this rejection for two reasons: 1) Bitterly's device does not need a heat shield since Bitterly already has fully capable active cooling systems in his device, and 2) Shramo teaches a heat shield, not an outgassing barrier coating on the stator. Shramo's heat reflecting shield 37 would not prevent outgassing even if it were to be used in Bitterly.

1) Bitterly uses an active cooling system for his top and bottom bearings and his stator 290 (after it has been moved into the elevated active operating position which, contrary to his statement in Col. 7, lines 16-18, is not illustrated in the drawings). Accordingly, Bitterly has already addressed the issue of cooling and does not need the heat reflecting coating taught by Shramo.

2) There is nothing in Shramo that teaches a low pressure atmosphere in his motor, or the feature or benefits of coating the windings 15 against outgassing. In fact, the heat shield 37 of Shramo could in no way be considered a "coating" of the stator because it merely sits in the housing between the stator and the rotor. Moreover, his heat shield would not serve as an outgassing barrier for his stator unless it were sealed in the housing, and the back and sides of the stator were also sealed, and there is no disclosure in Shramo of sealing the heat shield 37 in the housing.

Thus, Bitterly has no need of a heat shield of the type shown in Shramo, and even a Shramo heat shield were put in Bitterly's device around his stator, it would not serve the function claimed in claim 1. Accordingly, the rejection based on these references is unfounded, and claim 1 should be allowed.

Claim 19, likewise rejected over the combination of Bitterly and Shramo, calls for a flywheel system made of components assembled inside an evacuated chamber, with a barrier coating on the components to reduce outgassing. The barrier coating is a deposit of a vaporized metal vapor as barrier coating of the metal inside the chamber on the flywheel system components.

The rejection of claim 19 states that the combination of Bitterly and Shramo teach a flywheel system with components having a barrier coating to reduce outgassing from the components. As noted above, Shramo teaches a heat shield that would not act as a barrier coating to reduce outgassing. The coils in Shramo's stator would outgas in normal fashion and the gas would flow freely around the edges of the heat shield, and also out of the back and sides of the stator windings to degrade the atmosphere in Bitterly's vacuum enclosure. So Shramo does not include a teaching that would lead a person of ordinary skill in the art to put a barrier coating on Bitterly's components to reduce outgassing.

The Examiner states that Shramo teaches a barrier coating having a thickness between 1000 Angstroms and 10 mils. Applicants are unable to fined this disclosure in Shramo and respectfully request the Examiner to point out where this disclosure can be found in Shramo. Indeed, the only reference that Applicants can find to the thickness of a coating is in the last paragraph of Col 5 in which Shramo mentions that the thin metal coating on his coil form 37 for heat reflection is "a few Angstroms thick". (Line 58)

Claim 2-7 have been rejected under 35 USC 103 as unpatentable over Bitterly and Shramo, and further in view of Woodard. Woodard teaches a flywheel energy storage system having a sealed vacuum enclosure for holding the components of the flywheel assembly. He states that his flywheel could be be made of any suitable material, such as steel, Kevlar, fiberglass or carbon fiber. However, Bitterly specifies an operating speed of greater than 100,000 RPM, which would exceed the capabilities of any know steel in a flywheel. Substituting a steel flywheel for Bitterly's ultra-high strength flywheel with its "unique axial profile" would

produce a profound change to the essential high energy density characteristic of Bitterly, hence it would not be considered obvious to make such a change.

Claim 4 specifies that the electromagnetic coils are substantially enclosed in the barrier coating. Shramo teaches a metalized coating on the coil form 37. It is on one side only, not on the ends or the back of the stator windings. In no way could Shramo be considered to disclose a barrier coating that substantially encloses his coils.

Claim 5 calls for a laminated core in the motor/generator stator, and specifies that the barrier coating covers vacuum exposed surfaces of all laminations in the motor/generator core. Shramo does not have a laminated core. Shramo has a laminated spirally wound flux conductor 31 around the outside of the stator windings 15. That is not a core. A stator core is shown in Fig. 2 of Applicant's disclosure. Even if Shramo's laminated spirally wound flux conductor 31 around the outside of his stator windings 15 could be considered a "core", it could not be considered to be covered with a coating on the coil form 37, which is on the inside of the stator windings 15. Thus, claim 5 is not made obvious by Bitterly, Shramo and Woodard.

Bitterly does not teach a separate motor and generator as claimed in claim 6. Bitterly teaches an integral motor/generator unit that functions as a motor when accelerating the flywheel to store energy, and acts as a generator when decelerating the flywheel to recover energy.

The metal foil barrier coating of claim 7 is not disclosed in Shramo at Col. 5, lines 60-65 or anywhere else that Applicants can find. The disclosure on Col. 5, lines 60-65 refer to a thin metal coating a few angstroms thick, which is applied to the coil form by sputtering. This is not a metal foil, so Shramo does not constitute a teaching of a metal foil outgassing barrier coating the stator.

Claims 8 and 9 stand rejected under 35 USC 103 as unpatentable over the combination of Bitterly, Shramo, Woodard, and Johnson. Johnson discloses a stator core made of powdered magnetic material with embedded windings. There is nothing in Johnson, neither in Col 5, lines 50-58 or elsewhere that Applicants can find, that refer to foil coating bonded to the stator. Applicant requests that the Examiner explain the interpretation of Johnson to show a foil coating on the stator.

Claims 10, and 12-13 stand rejected under 35 USC 103 as unpatentable over Bitterly, Shramo, Woodard and Eisenhaure. Claim 10 specifies that the stator of the motor/generator is

enclosed in a nonmetallic container that holds a cooling liquid, and the nonmetallic container is coated with the barrier coating.

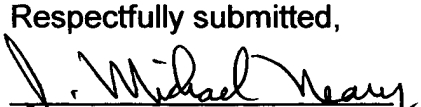
Eisenhaure discloses a flywheel energy storage system with a stator having a ceramic hub 61 and a ceramic sleeve 62 around the stator hub. Stator coils are wound on the outside of the ceramic sleeve. Vertical passages for coolant flow are provided between the sleeve 62 and the hub 61. The stator coils are not covered or coated with anything. There is nothing whatsoever mentioned about the use of heat reflecting barrier coating on the hub or the sleeve, as would be expected since liquid cooling would be entirely adequate to manage any heating of the stator. There is nothing mentioned in Eisenhaure about a outgassing barrier coating the stator. Shramo, as noted above, does not disclose an outgassing barrier coating on the stator. Thus, there is nothing in all this combination of art that would lead a person of ordinary skill in the art to modify Bitterly to substitute Eisenhaure's cooling scheme for Bitterly's cooling scheme, but even if it were done, it would not result in a device that fell within the scope of claim 10.

Claims 11 and 14-16 have been rejected under 35 USC 103 as unpatentable over Bitterly, Sharmo, and Asao. Asao teaches an AC generator for a vehicle. The ends of the stator windings are dipped in epoxy, but epoxy is not an outgassing barrier coating. In fact, epoxy itself produces outgassing. In any case, epoxy is never applied by physical vapor deposition.

Claims 14-16 specify low outgas coatings to reduce the outgassing from the stator windings. Asao does not teaching anything about reduction of outgassing, which is no surprise since that would be no reason for a vehicle generator to needa reduction of outgassing since it does not operate in a vacuum that could be degraded by outgassing.

Accordingly, Applicants believe that the claims now pending in this application are patentable over the references cited against them. If the Examiner, after reconsidering this application in view of these remarks, concurs with Applicants that these claims do indeed constitute a patentable improvement to the art, Applicants believe it would be appropriate to pass this application to issue.

Respectfully submitted,



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